Chapter Five

Water: Conservation is the Key

Key Learning Points

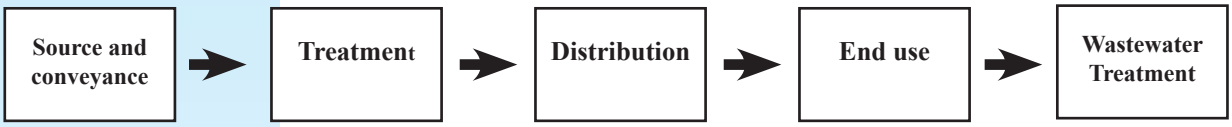
- Conserving water is an effective way to reduce greenhouse gas emissions: ***Use less, lose less, and waste less*** are the guiding principles of water conservation.
- Water shortages and periods of drought are projected to increase due to climate change.
- If you use water, you use energy.
- If you waste water, you waste energy and money.
- If you save water, you save energy and money.
- For every gallon of water used by the average U.S. family of four, three gallons are used by the power plant supplying the energy for the system which provides the water.
- Fremont's households use about 270 gallons of water per day - over 70% of the water used in the community. Therefore, the greatest opportunities for conservation and efficiency improvements lies in the existing and planned residential development throughout the city, and in behavioral changes by both current and future Fremont residents.

What is the relationship between water use, energy, and greenhouse gas emissions?

Water and energy are intertwined in a symbiotic relationship: most methods of producing energy require water[1]; and producing, distributing, heating and cooling usable water requires energy, as does its treatment once it becomes wastewater. Therefore, if you use water, you use energy. If you waste water, you waste energy, and if you waste energy, you waste water. And, in both cases, you waste money and generate greenhouse gas emissions.

Figure 5-1

The Water Supply – Use – Disposal Process



Source: National Resources Defense Council, "Energy Down the Drain: The Hidden Costs of California's Water Supply", August 2004, p. 2.

In California, this water-energy symbiotic relationship is dramatic: the State Water Project is the largest single user of energy in California, using about two to three percent of all electricity consumed in California.[2] Fremont's population directly contributes to this energy consumption, since Alameda County Water District, Fremont's water provider, relies on the State Water Project for approximately 40% of the water that the District supplies to its customers.

The indirect use of water required for the system of water production and distribution, which is hidden from the end user, is many times greater than the direct use, which is more tangible to the end user. Figure 5-2 illustrates the concept of *direct use* (water consumed in a home or other building for uses such as drinking, bathing, cooking, cleaning, and watering the landscape) and *indirect use*, which refers to the energy consumption associated with the production and distribution system. This figure shows that, for every gallon of water used

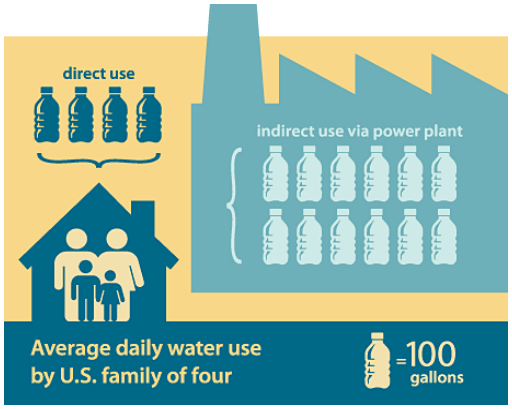
[1] Water use in energy production and distribution is a complex issue; even renewable energy systems, such as large-scale concentrated solar power facilities, rely on significant amounts of water in the production and export of electricity for end users. In addition, these systems use water to clean the parabolic mirrors or Fresnel lenses which are central to the system's design and operation. Even small-scale, on-site photovoltaic systems, such as those found on homes and businesses, require water for the manufacturing of the semiconductor materials in the panels, although no water is needed to convert sunlight to electricity once the panels are in use.

[2] The State Water Project, which provides water to two-thirds of California's population, is also a power producer, operating four pumping-generating plants and five hydroelectric power plants.

by the average U.S. family of four, three gallons are used by the power plant supplying the energy for the system which provides and distributes the water.[3]

Figure 5-2

Direct and Indirect Use of Water by American Households



Source: Union of Concerned Scientists

Reducing the use of water is therefore an important energy efficiency strategy – with the added benefit of saving money for the consumer. Reducing the amount of energy required for the production and distribution of drinkable water, and the treatment of wastewater, reduces the greenhouse gas emissions that result from these processes.

Another example of the *indirect use* of water is the use of millions of gallons of water in the manufacture of consumer products. Many of the concepts discussed in Chapter Four, about how materials management can reduce greenhouse gas emissions through energy savings, also apply in the water sector. By reducing consumption, and reusing and recycling manufactured products, each of us can help conserve water and energy, and reduce greenhouse gas emissions.

Some specific examples of how much water is used in the manufacture of everyday products include the following:[4]

- Manufacturing the steel for making a car takes about 80,000 gallons of water.
- Producing a gallon of gasoline uses from 1 to 2.5 gallons of water.

[3] This national average may not accurately reflect the actual ratio of direct to indirect use in California and, locally, in ACWD's service area, which utilizes electricity generated from relatively water-efficient facilities, such as hydropower. the concept of direct to indirect use, however, is still relevant in ACWD's service area.

[4] Source: *The Hidden Water in Everyday Products*, www.h20conserve.org

- It takes at least twice as much water to produce a plastic water bottle as the amount of water the bottle contains.

- It takes more than 700 gallons of water to make one new cotton shirt.

While technological improvements in buildings, appliances, vehicles, and manufacturing processes can all help reduce water and energy use, technology alone will not be enough to ensure that Fremont will achieve its goals for reducing greenhouse gas emissions. *Water conservation*[5] is a highly effective, cost-efficient, and generally easy strategy which individuals of all ages, businesses, organizations, and the community at large can pursue on a daily basis and help the city progress towards its emission reduction goals. ***Use less, lose less, and waste less*** **are the guiding principles of water conservation.**

Climate change and drought risk in California

Recent state actions have drawn attention to drought risks, including those related to climate change. California's 2010 *Drought Contingency Plan* (DCP), the state's first adopted drought plan, was developed following Governor Schwarzenegger's executive orders and drought proclamations for 2008 and 2009.[6]

The DCP highlights climate change-induced drought risks as follows:

[5] The Climate Action Plan utilizes the definitional distinction between the terms 'water conservation' and 'water use efficiency' which was made in the February 2010 *20x2020 Water Conservation Plan*, prepared by multiple California state agencies, as follows: "*Water conservation* is defined as a reduction in water loss, waste, or use. The general term water conservation may include *water use efficiency*, in which more water-related tasks are accomplished with the same or lesser amounts of water." (p. 2)

[6] California has experienced many periods of drought, as noted in the 2010 DCP (p. 3): "Historical multi-year droughts include: 1912-13, 1918-20, 1923-24, 1929-34, 1947-50, 1959-61, 1976-77, 1987-92, and most recently the current drought which began in 2007."

Warming temperatures due to global climate change, combined with changes in precipitation and runoff patterns, are projected to increase the frequency and intensity of droughts in California. Regions that rely heavily upon surface water (rivers, streams, and lakes) could be particularly affected as runoff becomes more variable, and more demand is placed on groundwater. Climate change and a projected increase in California's population will also affect water demand. Warmer temperatures will likely increase evapotranspiration[7] rates and extend growing seasons, thereby increasing the amount of water that is needed for the irrigation of many crops, urban landscaping and environmental water needs.[8]

These climate change-related drought risks have led to a growing body of new laws which mandate reductions to water and water-related energy use.

Fremont's water supply and wastewater treatment systems

Alameda County Water District (ACWD) is the public agency providing water service to the City of Fremont, as well as the neighboring cities of Newark and Union City. Union Sanitary District (USD) is an independent special district providing wastewater collection, treatment and disposal to the three cities. The two agencies developed a recycled water master plan in 1993 which served as the basis for ACWD's recommended approach to the use of recycled water (described later in this chapter). The two agencies have periodically updated the master plan, most recently in 2010.

Significant components of the system which captures and manages Fremont's local water supply, all of which originates in the Alameda Creek watershed, are visible to the public. These elements include:

- The watershed itself, an area of over 633 square miles which extends from Mt. Diablo in the north to Mt. Hamilton in the south, and eastward to the Altamont Pass. Approximately seven percent of the watershed is developed for residential, commercial or industrial purposes; the majority is undeveloped, open range land or public lands and parks.

- Alameda Creek and the Alameda Creek Flood Control Channel, containing two large, inflatable rubber dams spanning the channel's width which capture rainwater runoff, as well as a portion of the water supply from the State Water Project.

[7] Evapotranspiration refers to the loss of water from the soil through both evaporation and transpiration from the plants growing in the soil.

[8] Natural Resources Agency and California Department of Water Resources. *California Drought Contingency Plan*, November 2010, p. 3.

- Quarry Lakes, where the water from the flood control channel is diverted for percolation into the underlying groundwater basin.

Percolation ponds at Quarry Lakes.

In addition to these components, sixteen wells are used to extract water from the groundwater basin.

Table 5-1 provides an overview of the District and its customers.

Table 5-1

Alameda County Water District Data

Service Area:	Fremont, Newark, and Union City - 104.8 Square Miles
Population:	328,325 (January 2011)
Customers:	81,219 (May 2011)
Sources of Supply:	State Water Project: 40% San Francisco Public Utilities Commission (Hetch Hetchy): 20% Alameda Creek Watershed Runoff (recharges the Niles Cone Aquifer): 40%
Water Use by Category (FY 2008-09):	Residential: 30,846 acre feet (71.7%) Business: 5,919 acre feet (13.8%) Industrial: 3,435 acre feet (8.0%) Miscellaneous: 2,795 acre feet (6.5%)

Source: Alameda County Water District Fact Sheet

The diversity of ACWD's water sources provides the agency with flexibility in water resource management, but has the downside of limited District control over the majority (approximately 60%) of the supply. Decisions concerning water allocations from the non-local sources, especially in times of drought and water rationing, can have significant impacts on ACWD's customers.

The data in Table 5-1 reveals that the majority of water use – about 270 gallons per day per single family household - is by the residential sector. As such, the greatest opportunities for conservation and efficiency improvements lies in the existing and planned residential development throughout the city, and in behavioral changes by both current and future Fremont residents.

The Regulatory Context Affecting Water Use in Fremont

This section provides an overview of key current and future regulations and policies addressing water use in the City of Fremont. As a local agency, the City of Fremont is directly responsible for implementation and enforcement of some of these policies and regulations, while other agencies, such as Alameda County Water District, are responsible for others.

The California Global Warming Solutions Act of 2006 (AB 32) and the California Climate Change Scoping Plan (2008)

AB 32, the *California Global Warming Solutions Act of 2006*, required the Air Resources Board to prepare a Scoping Plan to achieve greenhouse gas emission reductions in California. The Scoping Plan defines the state's water sector to include groundwater, surface water, agricultural use, urban use, conveyance, treatment, wastewater, and water recycling. The Scoping Plan includes three measures targeting the reduction of energy requirements associated with providing reliable water supplies, and two measures focused on reducing the amount of non-renewable electricity associated with conveying and treating water. Some of these measures will be implemented locally through SB x7-7.

SBx7-7: The Water Conservation Act of 2009

California Senate Bill 7 (SBx7-7), *The Water Conservation Act of 2009*, was enacted in November, 2009. SBx7-7 requires the state to reduce per capita water consumption by 20% by the year 2020, regardless of the sufficiency of existing water systems. The state would also be required to make incremental progress towards this goal by reducing per capita water use by at least 10% on or before December 31, 2015. SBx7-7 is an example of legislation which implements measures identified in the AB 32 Scoping Plan.

The California Department of Water Resources has developed four methodologies for adoption by water agencies to ensure compliance with SBx7-7 and to support the state's efforts to meet the reduction of per capita water consumption by the two target years. ACWD has elected to use "Target Method 4", which provides for flexibility in implementation in response to local circumstances.

SB 407 (2009): Water-efficient Plumbing Fixture Requirements

Another State law (see California Civil Code sections 1102.155 and following, and 1101.1 and following) requires certain residential and commercial properties built before 1994 to install water-efficient plumbing fixtures by 2017 and 2019, respectively. The regulations address fixtures such as showers, urinals and toilets. Since the amount of existing residential and commercial buildings in Fremont exceeds the amount what can be built in the future, under

the provisions of the City's General Plan and the availability of developable land, there is significant potential to conserve water (and energy), and to reduce greenhouse gas emissions, by replacing older fixtures with more efficient ones.

2010 California Green Building Standards Code (CALGreen) and the State Water Efficient Landscape Ordinance (WELO)

The California Green Building Standards Code does not mandate the use of specific high-efficiency types of water fixtures to achieve water conservation and efficiency. Instead, the Code's water efficiency measures, which became effective in July 2011, are performance-based, requiring a 20 percent reduction in potable (drinkable) indoor water use and, for outdoor water use, the development of a water budget for landscape irrigation according to the State Water Efficient Landscape Ordinance (WELO). The City has been enforcing the requirements of the State ordinance since its adoption on January 1, 2010, through the building permit process.

Flannel bush, or Fremontia, (Fremontodendron spp.), is a California native plant that needs little water to thrive. The plant was named after Major General John C. Frémont, the City of Fremont's namesake.

WELO applies to all residential projects (except single-family homes) with landscape areas larger than 2,500 square feet in size, as well as single-family home projects with landscape areas larger than 5,000 square feet in size.

2010 Bay-Friendly Landscape Requirements

On July 1, 2010, Bay-Friendly Landscape requirements for new and renovated projects went into effect. The City requires private projects to meet at least seven of the nine minimum Bay-Friendly Landscape requirements, many of which include water-saving measures.

Potential use of Recycled Water and Other Non-Potable Water Sources

Alameda County Water District and Union Sanitary District have evaluated several opportunities for the use of recycled water in ACWD's service area. ACWD does not currently offset potable water demands through the use of recycled water or other non-potable sources. However, ACWD's plans include implementation of alternative water sources in the future for non-potable uses, including industrial uses and landscape irrigation.[9]

State law (Government Code section 65601 and following) requires local agencies to adopt ordinances requiring new subdivisions to install separate plumbing systems for delivery of recycled water for non-potable uses, **if** recycled water will be available from the water supplier within ten years. The local agency must adopt the ordinance within 180 days of receiving notification from the water agency of the planned availability of recycled water. The District's *2010-2015 Urban Water Management Plan* states that ACWD's long term water supply strategy includes provisions for a potential future recycled water project, and indicates that the planned implementation of a recycled water project in the ACWD service area is still at least ten years away[10]. Because the planned implementation of a recycled water project in the ACWD service area is at least 10 years away, it does not appear that the city will be required to adopt an ordinance as required by state law during the timeframe of the CAP. However, to date, the City has required the installation of separate distribution systems for recycled, non-potable water (commonly known as 'purple pipe') in selected large development projects as part of the approval process. To support the successful implementation of the use of recycled water in the future, the City will continue its practice of encouraging or requiring the installation of separate distribution systems for non-potable water in development projects.

In addition to encouraging large-scale, area-wide systems, the Climate Action Plan supports small-scale, on-site use of recycled water, known as 'greywater systems' or 'laundry to landscape systems', as a way to maximize water use efficiency. In a residential context, "greywater" refers to the leftover water from bathtubs, showers, hand basins and washing machines. Some definitions of greywater also include water from the kitchen sink. Greywater systems capture this leftover water for uses such as landscape irrigation and, if allowed by State and local regulations, toilet flushing.

[9] Alameda County Water District, *2010-2015 Urban Water Management Plan*, adopted June 9, 2011, p. 6-2.

[10] Ibid., p. 6-4.

Actions for Reducing Greenhouse Gas Emissions

The Climate Action Plan's approach to reducing greenhouse gas emission from the use and treatment of water throughout the community includes:

- Collaborative efforts with agencies such as ACWD and organizations such as the California Youth Energy Services
- Continuation of existing regulatory programs
- Evaluation of potential new programs, such as a Residential Energy Conservation Ordinance, whose purpose would be to achieve water savings in the City's existing housing stock.

Staff will collaborate with stakeholders when undertaking work on actions in this chapter, especially for those actions which may result in new local regulations.

Specific ideas for actions which individuals, businesses and organizations can take to help reduce greenhouse gas emissions from their use of water can be found in the section titled "What You Can Do!"

For more information about the proposed actions to reduce water use in City of Fremont operations, as well as a description of current City practices that achieve reductions in water use, see Chapter Six, "Municipal Operations."

Emission Reduction Actions and Implementation Timeline

GOAL: Reduce greenhouse gas emissions through water conservation and efficient use of water resources, collaborative efforts with other public agencies, outreach and educational efforts to promote behavior change, and creating the conditions that support people's ability to make choices which support this goal.

Short-term actions: 1-3 years from Plan adoption

Advocate

W-A1 Continue the annual collaboration with the California Youth Energy Services program to conduct residential energy and water audits and to distribute water-saving shower heads and faucet aerators to Fremont households, as replacements for less efficient fixtures. (This action is also listed in the "Energy" Chapter). ***Greenhouse gas emission reduction potential through 2020: 400 MTCO$_2$e***

Collaborate/participate

W-C1 Continue to implement the Water Efficient Landscape Ordinance for private development.

W-C2 Collaborate with Alameda County Water District to implement water conservation and reclamation programs.

Promote/encourage

W-P1 Encourage use of on-site recycled water systems, (also known as 'greywater systems' or "laundry to landscape') consistent with all environmental and health and safety regulations and Alameda County Water District policies and requirements.

Medium-term actions: 3-5 years from Plan adoption

Regulate

W-R1 Consider adopting a residential energy conservation ordinance (RECO), which would require energy assessments and implementation of measures to reduce energy and water use at time of sale and/or other trigger points. (This action is also listed in the "Energy" Chapter).

Long-term actions: 5-10 years from Plan adoption

Collaborate/participate

W-C3 Collaborate with Alameda County Water District to adopt a retrofit program to encourage installation of water conservation measures in existing businesses and residences.

W-C4 Collaborate with Alameda County Water District and Union Sanitary District to support the use of recycled water.

W-C5 Support development of a process for permitting, registration, and inspection of greywater systems by the City.

W-C6 Consult with ACWD in developing policies and regulations supporting the use of water conserving strategies, including greywater systems.